

1

OLECRANON FRACTURE FIXATION SYSTEM

CROSS-REFERENCES TO RELATED APPLICATIONS

This application claims priority from U.S. Provisional Patent Application No. 61/035,274 filed Mar. 10, 2008.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

Not Applicable.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to devices for the surgical fixation of a fracture to promote bone healing, and more particularly to olecranon fracture fixation systems.

2. Description of the Related Art

The elbow joint includes three bones: the humerus, the ulna, and the radius. These three bones are connected by ligaments, and muscles and tendons move the three bones around each other. During motion, bending and straightening of the elbow occurs between the humerus and the ulna. The olecranon is the part of the ulna that interfaces with the end of the humerus and moves around the end of the humerus to create the hinge-like motion of the elbow. The olecranon is attached by a tendon to the upper arm triceps brachii muscle which straightens the elbow by a pulling force on the olecranon.

Olecranon fractures are quite common, and can impair the ability to straighten the elbow joint. When the olecranon is fractured, the powerful triceps brachii muscle tends to pull the bone fragment upward away from the main portion of the ulna, and it can be difficult to set the bone fragment of the olecranon in its proper position for healing. Therefore, various devices have been developed for fixing bone fragments of the olecranon under compression to enhance the rate of healing.

In a one type of device and associated methods for fixing the olecranon, a hole is drilled in the end of the bone fragment and a cancellous intramedullary screw is directed into the intramedullary canal of the proximal portion of the ulna. Intramedullary screw technology typically uses a 6.5 to 7.3 millimeter screw, and the head of the screw or a washer compresses the olecranon fragment against the proximal ulna. Because the intramedullary screw does not have a locking mechanism, it is at potential risk for backing out, which would result in loss of fixation and need for hardware removal and potential re-operation for repeat fixation.

In another type of device and associated methods for fixing the olecranon, a fixation plate is used. For example, the Mayo Clinic Congruent Elbow Plate System is commercially available from Acumed, Hillsboro Oreg., USA. This plate system is an olecranon plate capable of treating osteotomies and fractures, providing excellent fixation in the proximal ulna. Prongs on the proximal tip of the olecranon plate provide provisional fixation into the triceps tendon, assisting with reduction, and improving final stability. The plate is placed directly over the triceps tendon. Locking screws are interlocked to provide a stable fixed angle structure inside the bone fragment. The plate is applied with compression across the olecranon fracture.

In yet another type of device and associated methods for fixing the olecranon, tension band wiring is used. This technique is shown in FIGS. 1 and 2 of U.S. Pat. No. 7,037,308.

2

Pins are driven longitudinally into the olecranon across the fracture line, and a flexible wire is passed through a drill hole on the ulnar side of the fracture line. The two ends of the wire are crossed over the fracture line to the olecranon side of the fracture line. One wire is then passed under ends of the two pins, and the wire twisted and tightened to the other end of the wire to develop tension in the wire to produce compression across the olecranon fracture. However, tension band wiring has been shown in biomechanical studies to not provide the same strength and rigidity as an intramedullary screw. It also has the problem of backing out and potentially necessitating a second surgery for hardware removal.

In still another type of device and associated methods for fixing the olecranon, there is provided an implant with a wire element having two spaced adjacent legs which are adapted to be implanted longitudinally in the bone across the fracture site. The wire element extends outwardly of the bone, and the legs are bent and extend backwardly into juxtaposition with the legs in the bone and are joined by a U-shaped loop connecting portion. A tensioning device is engageable with the connecting portion and with a fixation device secured to the bone to apply force to the connection portion and produce tension in the wire element to develop compression across the fracture site. See U.S. Pat. No. 7,037,308 and PCT International Publication Number WO 03/068080. One disadvantage with this device is that the U-shaped loop that goes on the outside of the bone and the tensioning device leave hardware prominent on the subcutaneous border of the ulna which can cause patient discomfort.

Still other types of devices and associated methods for fixing the olecranon can be found in U.S. Pat. Nos. 3,990,438, 4,212,294 and 5,549,609 and European Patent Application EP 1792578 A1.

While these known olecranon fracture fixation systems and methods may be acceptable for certain applications, there still exists a need for an improved device for olecranon fracture fixation.

SUMMARY OF THE INVENTION

The present invention addresses the foregoing needs by providing a fracture fixation system for a bone having a fracture line between a central section of the bone and an end section of the bone. The system includes an intramedullary core that is dimensioned for insertion in an intramedullary canal of the bone, and a hollow shell that is dimensioned for insertion in the intramedullary canal of the bone. The shell includes fixation elements that extend outwardly away from a proximal end of the shell. A fastener is provided for attaching the shell to the core in the intramedullary canal. When the core and shell are inserted in the intramedullary canal, the fixation elements extend away from the fracture line of the bone, and when the core and shell are attached in the intramedullary canal, the fixation elements engage an end surface of the end section of the bone. In one example version of the invention, the system is an olecranon fracture fixation system wherein the fixation elements are dimensioned to engage the triceps tendon and/or an end surface of the olecranon when the core and shell are attached in the intramedullary canal of the proximal ulna.

In one aspect of the fracture fixation system, one or more of the fixation elements can include a leg having a curved end that engages the end surface of the end section of the bone and/or the tissue.

In another aspect of the fracture fixation system, one or more of the fixation elements can include a wire loop having